LIST PROCESSING
AND STRUCTURED DATA

A three-day seminar

A comprehensive introduction to concepts of symbols and data structures for data processing practitioners interested in their application in both scientific and business programming efforts. The seminar is intended for people whose programming work involves them in PERT & CPM networks, inventory control, algebraic manipulation, information retrieval, artificial intelligence, impacting, teaching, project management, compilers and systems software, text processing, and processing of all kinds of structured data and symbolic information. Tuition, including luncheons and course materials, is $195 for the first student and $175 for additional students from the same organization.

Americana Hotel
New York, N. Y.
July 18, 19, 20

INSTITUTE FOR ADVANCED TECHNOLOGY

C-E-I-R INC

Register me for: LIST PROCESSING ☐

NAME:_____

TITLE:_____

COMPANY:_____

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1200 Jefferson Davis Highway
Arlington, Virginia

LIST PROCESSING AND STRUCTURED DATA

A Three-Day Seminar
July 18, 19, 20
Americana Hotel
New York, N. Y.

A technical seminar for programmers, systems analysts and others with computer programming responsibility. The major subject is list processing, and the LISP programming language is the primary tool used in discussions and student exercises. Among the many uses of list processing and the LISP language are writing of compilers and systems software, advanced inventory control systems, impacting techniques, PERT-CPM and other sophisticated project management systems, algebraic manipulation and formula processing, text and natural language processing, information retrieval, and artificial intelligence. Tuition, including luncheons, computer processing of student programs, and the text "LISP 1.5 Programmer's Manual." is $195 for the first student and $175 for additional students from the same organization.

C-E-I-R INC.

Institute for Advanced Technology
1200 Jefferson Davis Highway
Arlington, Virginia 22202
Area Code 703—OT 4-6377

THE INSTRUCTOR: Larry Constantine is a C-E-I-R, Inc., program consultant assigned to the C-E-I-R research and computation center at Boston, Mass. In addition to his experience in application of list processing techniques, Constantine has a background in business data processing, production of generalized programming packages, and graphic input and graphic display. He was responsible for the major portion of the design and programming for the NASA Launch Vehicle Model and directed implementation of the PERGO system, a major new project management tool which utilizes list processing techniques. His programming experience includes work with the IBM 1401, 7010, 7094, Univac 1107 and CDC 160-A. He is the author of "Elusis: Inductive Inference on the IBM 7094" and several magazine articles slated for publication this spring. Prior to his current assignment, he worked as programmer analyst at Scientific Computers, Inc., and as technical aide at the Massachusetts Institute of Technology Laboratory of Nuclear Science. Constantine is a member of the ACM and the Special Interest Committee on Symbolic and Algebraic Manipulation. He is currently co-authoring a book titled "Structure and the Design of Programs."

REGISTRATION: Tuition is $195 for the first student and $175 for each additional student from the same organization. Classes begin each day at 9 a.m. and continue through 5 p.m. Hotel rooms are not included.

HOTEL ACCOMMODATIONS: The seminar will be presented at the Americana Hotel, Seventh Avenue at 52nd Street, New York, N. Y. The Americana is holding a block of single rooms at $16 per day (twin at $24) for reservations by seminar participants until twelve days prior to the seminar.

OTHER COURSES: Among other seminars in the C-E-I-R seminar program is:

SURVEY OF DATA COMMUNICATIONS: For data processing personnel preparing for "on line" or "real time" systems involving data communications. Covers hardware and software considerations important to successful system design, and data communications concepts and terminology. Executive House, Washington, D. C., July 19, 20, 21.

For an outline of this seminar or others scheduled in coming months, write:

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COURSE OUTLINE

INTRODUCTION TO SYMBOLS AND STRUCTURES
- What is a symbol
- Symbols with values, symbols for their own sake
- Numeric processing—symbolic processing contrasted
- Operations on symbols
- What is structure
- Examples of common data structures: strings, lists, binary trees, networks, directed graphs.
- Relationships between symbols and structures
- Problems in representing and manipulating symbolic data
- External and internal forms of data
- Implementation: storage allocation and control

APPLICATIONS AREAS FOR LIST AND SYMBOL PROCESSING
- Discussion of current and potential uses
- Application to Network Processing, PERT/CPM, Inventory Control, Impacting, Project Management Systems
- Uses in Artificial Intelligence, Information Retrieval, Text Manipulation, Teaching Systems, Compilers and Systems Software, Algebraic Manipulation
- Relationship of symbolic processing to conventional problems in business, science, and engineering
- Recognizing potential applications and designing systems using list processing subsystems

LIST PROCESSING LANGUAGES
- Description of a test problem
- Salient features of COMIT, IPL-V, SLIP, LISP, SNOBOL, METEOR, CLP
- Comparisons, relative advantages, specific fields of application for each language
- Programming the test problem in each language

THE LISP LANGUAGE
- The language and system
- Specific machine implementations

- Functional languages (like LISP) compared to procedural
- Fundamentals of the LISP language:
    - The elementary functions and predicates
    - Creating new functions, composition
    - Residence of control, conditional forms, recursion
- Study of recursive functions, defining functions
- Slagles Heuristics: shortcut to program design
- Church's LAMBDA-notation, naming functions, DEFINE

FURTHER STUDY OF THE LANGUAGE AND SYSTEM
- Writing procedures, the PROG feature
- Functions and pseudo-functions
- Local and global values, free and bound variables
- The A-list and limits of binding
- Functions and forms
- Functions with functions as arguments
- The meta-language

USING LISP
- The interpreter, top level functions
- The LISP compiler
- Overlord, the LISP monitor
- Preparing card input to LISP 1.5
- Debugging, tracing, and input-output
- Implementing LISP by bootstrapping
- A language defined in itself
- Detailed study of the LISP interpreter, APPLY and EVAL

APPLICATION OF LISP TO CONVENTIONAL PROBLEMS
- Areas where LISP has been used
- Where it could be used, limitations
- Discussion of several specific program uses
- Overcoming some of the difficulties

SUMMARY AND DISCUSSION
- Tying in the concepts of symbol and structure, the list processing languages, LISP, and the applications
- Extensions to existing languages
- A look to the future

C-E-I-R INC is an international applied research and data processing corporation that offers analytical, scientific and computer services to business, science and government. Founded in 1954, it is today the world's largest, most experienced and best equipped independent organization in its field. The C-E-I-R professional staff includes several hundred mathematicians, statisticians, economists, operations researchers, management scientists and others from a variety of disciplines. In addition, many of the finest scientific and professional men in America are retained on a consultant basis. Augmenting this professional capability are modern electronic computing equipment, and skilled computer programmers and operations personnel at computing centers in five major U.S. cities, London, The Hague and Mexico City.

INSTITUTE FOR ADVANCED TECHNOLOGY is the latest expression of C-E-I-R's long-standing involvement in management education. The revolutionary nature of computer-based methods made education an integral part of C-E-I-R operations from the beginning. This relationship is formalized through the Institute for Advanced Technology. IAT faculty members are drawn primarily from the ranks of C-E-I-R's professional and computer operations staffs. Its curriculum is drawn from subjects in which C-E-I-R staff members are expert—recognized for excellence in day-to-day application of the art and science of computer usage to the real problems of C-E-I-R customers in business and industry. Sharing these new skills through seminars in major cities, management clinics, and special, in-plant training programs is the major goal of the Institute for Advanced Technology.

MANIPULATING SYMBOLS

AND STRUCTURED DATA

Dear Sir:

The three day seminar, LIST PROCESSING AND STRUCTURED DATA, is a comprehensive introduction to concepts of symbols and data structures. Though it deals with advanced material in computer applications, its down to earth format means immediate value to you in designing:

+ Techniques for handling very large and/or complicated information files.

+ More effective, efficient methods for processing files in which items are inter-related or cross-connected.

+ Better approaches to text manipulation including abstracting, indexing, and information retrieval.

+ Faster verification and testing techniques for complex data processing tasks.

The course is taught by Larry Constantine, who has pioneered applications of list processing in commercial problems. He describes himself as "a practitioner, a professional whose responsibility is to translate ideas into working systems" and this is thoroughly reflected in the pragmatic orientation of the seminar. It is designed to give you both things that show on your resume (like a working knowledge of the LISP programming language) and things that show in your performance (like an understanding of symbolic processing and its applications).
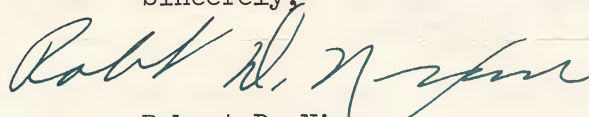
Throughout, the emphasis is on commercially significant applications: in management reporting, in inventory control, in network processing, in algebraic manipulation, KWIC and KEYWI systems, and others.

The course includes:

+ An introduction to the general concepts of symbols and data structures providing the participant with new orientations to conventional problems.

+ A comparative study of seven List Processing languages to facilitate selection of appropriate languages.

+ A functional introduction to the LISP language both as a programming language valuable in itself and as a concrete framework for discussion.

+ Study of applications in such diverse areas as: matching personnel qualifications to requirements, algebraic manipulation, and key-word indexing.

As you can see, List Processing is not just for the artificial intelligence worker. It has proved to be an effective tool, not only for things as "way out" as theorem proving, but for things as "way in" as your next project management system. Why not join other serious professionals who, like yourself, are interested in advancing their technical competence (and their careers)? The seminar is at the Americana Hotel in New York City, on July 18, 19, and 20. Mail the enclosed registration form today.

Sincerely,

Robert D. Nixon
Director of Curriculum